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Art. III.—*A Fossil Beaked Whale from Lakes Entrance, Victoria.*

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Abstract

The rostrum of a large beaked whale, derived from the Kalimnan (Pliocene) of Gippsland, is described. It is conspecific with a ziphiid rostrum described by Chapman from Western Victoria which is recognized as *Mesoplodon longirostris*. The taxonomy and stratigraphic distribution of *Mesoplodon* are discussed. Physiological explanations of peculiar structural features of the ziphiid rostrum are reviewed.

Introduction

The first report on a rostrum of *Mesoplodon* (Cetacea, Fam. Ziphiidae) in the Tertiary of Victoria was published by F. Chapman (1917). He described one well-preserved and one fragmentary specimen from the Kalimnan (Pliocene) of Grange Burn, near Hamilton, Western Victoria.

During the early stages of the excavation of a shaft near Lakes Entrance, Gippsland, about 1942, another rostrum of a beaked whale, of rather different general appearance, was found. Mr. Chapman, to whom the fossil was submitted, identified it as *Mesoplodon,* apparently conspecific with that described by him in 1917. Permission to examine and describe the specimen was obtained by the present writer from Mr. C. S. Demaine, of Melbourne, who also supplied detailed information about its occurrence. Mr. Chapman's valuable type specimen and a skull of *Mesoplodon grayi* described by Brazenor (1933) were made available for comparison by the late Mr. D. J. Mahony and Mr. R. A. Keble, of the National Museum, Melbourne.

Genus **Mesoplodon** Gervais, 1850

This much-discussed genus includes nine living species (Raven 1937). Most of the fossil remains assigned to it consist only of parts of the cranial rostrum. Detailed studies of numerous Recent skulls have shown that the most important specific characters recognizable in the rostrum of *Mesoplodon* are:—

(1) The presence or absence of the basirostral (maxillary alveolar) groove;

(2) The relative position of the premaxillary and maxillary foramina at the base of the rostrum;

(3) The lateral outline of the base of the rostrum,

(4) The relation of bones participating in the formation of the region of the antorbital notch.

In connection with (1), it may be mentioned that vestigial teeth are present in the gums of the upper jaw in some forms, and that the shape and position of the large mandibular teeth are taxonomically important features. However, teeth do not usually occur in their original connection with fossil cranial rostra.

The significance of the character mentioned under (2) was explained by Raven (1937, p. 6), who stated:—

"The conspicuous maxillary foramen which affords an exit for the principal branch of the nervus infraorbitalis is situated close to the lateral border of the premaxillary bone, where the latter is constricted at the base of the rostrum. The premaxillary foramen in *Mesoplodon* is always located at the rostral border of the very slight depression that marks the site of the ventral spiracular, or premaxillary sac. In some species of *Mesoplodon* the premaxillary foramen is in advance of the adjacent maxillary foramen, in other species behind the maxillary foramen. This depends upon the size and shape of the sac. In *M. europaeus* the sac is relatively long, consequently the premaxillary foramen is decidedly in advance of the maxillary foramen."

As the shape and the state of ossification of the median and distal parts of the rostrum are known to vary greatly with age and sex, they do not possess any taxonomic value. This was recognized only after a considerable number of fossil representatives of *Mesoplodon* had been described. The published descriptions and figures of most of these fossils do not indicate any differences in essential specific features. Differences previously considered as specific and even generic are almost exclusively those distinguishing Recent individuals of different sex or age.

At the present time not more than one fossil species of *Mesoplodon* can be definitely recognized and characterized. This was first stated by Abel (1905, p. 111) who, after examining 18 fossil specimens of *Mesoplodon* from Antwerp, came to the following conclusion:—

"Il ne peut subsister de doute que toutes les différences qui existent entre les rostres de Mésoplodontes fossiles connus jusqu'à présent, ne suffisent pas pour fonder de nouvelles espèces, a plus forte raison différents genres. La forme et les différences de grandeur, ainsi que le degré d'ossification du vomer varient extrêmement; on serait obligé, en poussant la minutie aussi loin que R. Owen, du Bus et Capellini, de distinguer, dans le Bolderien d'Anvers, non moins de 15 a 18 espèces."

Abel placed not less than 25 species, described under six generic names, in the synonymy of *M. longirostris*, but only about 15 of these are based on material which is comparable with the type. Kellogg (1928, p. 61) has pointed out that the number of Recent species of *Mesoplodon* makes it likely that several species of this genus existed contemporaneously in late Tertiary time. This probability, however, does not justify the use of specific names based entirely on characters which are known to be variable within the limits of Recent species.

Mesoplodon longirostris (Cuvier), 1923

(Plate 1., Text fig. 1)

1823.—*Ziphius longirostris* Cuvier, Ossements fossiles, p. 356, pl. 27, figs. 9, 10.

1851.—*Mesodiodon longirostre* (Cuvier): Duvernoy, Ann. Sci. Nat., Zool, ser. 3, vol. 15, p. 60, pl., fig. 5 (holotype re-figured).

1852.—*Dioplodon beccanii* Gervais, Zool. Pal. Franç., vol. 2, p. 38 (not seen).

1856.—*Ziphius longirostris* Cuvier: Owen, Quart. J. Geol. Soc., vol. 12, p. 288, fig. 24

1864.—*Belemnoziphius compressus* Huxley, Quart. J. Geol. Soc., vol. 20, p. 393, pl. 19, figs. A–D.

1868.—*Belemnoziphius recurvus* Du Bus, Bull. Acad. Roy. Belg., sér. 2, vol. 25, p. 630

1870.—*Ziphius longirostris* Cuvier: Owen, Palaeont. Soc., vol. 23, pp. 6, 7.

1870.—*Ziphius gibbus* Owen, ibid., p. 17, pl. 2, fig. 2, pl. 3, fig. 3.

1870.—*Ziphius angustus* Owen, ibid., p. 19, pl. 3, figs. 1, 2.

1870.—*Ziphius angulatus* Owen, ibid., p. 20, pl. 4, figs. 1, 2.

1870.—*Ziphius medilineatus* Owen, ibid., p. 22, fig. 10, pl. 4, fig. 3.

1870.—*Ziphius tenuirostris* Owen, ibid., p. 24 pl. 5, figs. 1, 2.

1870.—*Ziphius compressus* Owen, ibid., p. 25, pl. 5, fig. 3.

?1876.—*Belemnoziphius prorops* Leidy, Proc. Acad. Nat. Sci. Philadelphia (1876), p. 81.

?1877.—*Dioplodon prorops* Leidy, J. Acad. Nat. Sci. Philadelphia, vol. 8, ser. 2, p. 226, pl. 30, figs. 3, 4.

1885.—*Dioplodon longirostris* (Cuvier): Capellini, Mem. Roy. Accad. Sci. Bologna, ser. 4, vol. 6, p. 294, pl. 1, figs. 1-3.

1885.—*Dioplodon gibbus* (Owen): Capellini, ibid., p. 295, pl. 1, figs. 4,5.

1885.—*Dioplodon medilineatus* (Owen): Capellini, ibid., p. 298, pl. 1, fig. 12.

1885.—*Dioplodon tenuirostris* (Owen): Capellini, ibid., p. 296, pl. 1, figs. 6-8.

1885.—*Dioplodon bononiensis* Capellini, ibid., p. 296, pl. 1, figs. 9-11.

1885.—*Dioplodon senensis* Capellini, ibid., p. 298, pl. 1, figs. 13-18.

1885.—*Dioplodon lawleyi* Capellini, ibid., p. 299, pl. 1, figs. 17, 18.

1887.—*Dioplodon longirostris* (Cuvier): Lydekker, Catal. foss. Mammals Brit. Mus., vol. 5, p. 68, figs. 13, 14.

1890.—*Mesoplodon floris* Newton, Quart. J. Geol. Soc., vol. 40, p. 448, pl. 18, fig. 7.

1891.—*Mesoplodon longirostris* (Cuvier): Newton, Vetebr. Plioc. Dep. Britain (Mem. Geol. Survey), p. 8, fig. 7?

1891.—*Mesoplodon tenuirostris* (Owen, *gibbus* (Owen), *angustus* (Owen), *angulatus* (Owen), *compressus* (Huxley): Newton, ibid., p. 73.

1891.—*Mesoplodon floris* Newton, ibid., p. 74.

p. 371, pl. 1, figs. 2-6.

1891.—*Dioplodon farnesinae* Capellini, Mem. R. Accad. Sci. Bologna, ser. 5, vol. 1,

?1891.—*Dioplodon tenuirostris* (Owen): Capellini, ibid., p. 371, pl. 1, fig. 7 (very small fragment, *indet.*).

1905.—*Mesoplodon longirostris* (Cuvier): Abel, Mém. Mus. Roy. Hist. Nat. Belg., vol. 3, p. 110.

1917.—*Mesoplodon compressus* (Huxley): Chapman, Proc. Roy. Soc. Vic., vol. 30, n.s., p. 35, pl. 4, figs. 1-4; pl. 5, figs. 7-11.

Diagnosis: Rostrum long, narrow, and pointed, resembling in shape that of the living *M. grayi;* slightly inflated in its proximal half, strongly compressed laterally, oval in cross section. Length variable. Mesorostral ossification well developed, in young specimens only in the distal portion of the rostrum, in adult individuals filling the entire length of the space between the premaxillaries and finally fused with the mesethmoid. Alveolar (basirostral) groove developed as a fairly deep furrow with sharp edges along the flank of the rostrum. Premaxillary and maxillary foramina situated (as in *M. bidens* and *M. mirus*) approximately on the same transversal line, not far behind the "inner notch." The premaxillary foramina are slightly smaller than the maxillary foramina. The maxillary ridges are weak. The area of attachment of the palatines ends in a single anterior point. The posterior ventral part of the rostrum forms a triangular downward projection most of which was apparently covered by the pterygoids.

Distribution of *Mesoplodon longirostris*

VICTORIA

The new specimen was found in a shaft in allotment 31, Parish of Colquhoun, County of Tambo, Gippsland, less than 1 mile north-east of Lakes Entrance, 6-7 feet below the present surface and at an elevation of about 80 feet above sea level. It was resting on the surface of a calcareous bed considered as the top of the Kalimnan (Pliocene) which is in this vicinity about 160-170 feet thick (Singleton 1941, Crespin 1943). The specimen was evidently weathered out of late Kalimnan beds more or less in situ and, subsequently, with some of the hardened fossiliferous matrix still adhering to it, embedded in non-marine post-Kalimnan (Upper Pliocene or Pleistocene) clays which in this area overlie disconformably the Kalimnan strata.

Chapman's specimen came from Grange Burn in Western Victoria, where "the typically Kalimnan beds of MacDonald's and Forsyth's are separated from the underlying Balcombian by a thin nodule bed marking a stratigraphic break" (Singleton 1941, p. 78). The appearance of the specimen shows clearly that it was taken from this nodule bed. The age of Chapman's specimen is believed to be early Kalimnan (Pliocene).

Belgium

The locality of the holotype of *M. longirostris* is unknown, but Abel (1905, p. 110) assumed that it came from Antwerp. According to this author, the eighteen specimens of this species from Antwerp examined by him came from the "Bolderien". It appears that Abel followed the stratigraphic classification of the Antwerp Tertiary proposed by van Ertborn who distinguished only two formations, the Bolderien (Miocene) and the Diestien (Pliocene). Later authors divided the Miocene of Belgium into the older Bolderien and the younger Anversien, representing, respectively, the Helvetian (Middle Miocene) and the Tortonian-Sarmatian (Upper Miocene). The presence of equivalents of the next younger stage, the Pontian, in this basin is uncertain. A stratigraphic break separates the Anversian from the Diestian (Pliocene).

Remains of fossil whales are known from several zones within the Anversian and Diestian. The actual horizons of occurrence of many of these fossils have not been reliably recorded. There is, however, little doubt that at least some of the specimens of *M. longirostris* came from the typical grey sands of the Anversian. Abel referred all of them specifically to the Upper Miocene (pre-Diestian). Kellogg (1928, p. 764) listed the Ziphiidae of Antwerp as "Sarmatian" (lower part of Upper Miocene).

Crag of East Anglia

Six of the specimens described by Owen under as many different specific names have since been placed in the synonymy of *M. longirostris*, together with another specimen later described by Newton. All these came from the "Nodule bed" at the base of the Red Crag (Newton 1891, pp. 72-74). Prestwich referred to a "*Belemnoziphius*" from the Nodule bed at the base of the Coralline Crag. The age of these fossils does not appear to have been defined as clearly in recent publications as in Owen's work, where it is stated that "the rolled and fragmentary Cetacean remains belong to a deposit older than these which, by their testacean fossils, may be truly or strictly defined as 'Red Crag': that the older deposit in question —more or less destroyed and broken up in Suffolk—answers in time, to the better known Belgian 'Sable noir' of the 'Système Diestien' of Nyst and von Koenen" (Owen 1870, p. 2). The only correction to be made in this statement is due to a change in stratigraphic classification in Belgium, where the 'Sable noir' is now classed as Anversian. Newton (1891, p. 3) also considers these Crag fossils as "remanié", derived from beds older than the "older Pliocene" Lenham beds, but finding the evidence for their Miocene age insufficient, he refers them to an early Pliocene stage. In view of the generally accepted Plaisancian (Lower Pliocene) age of the Lenham beds, this can be only the Pontian. As far as the Cetaceans are concerned it is difficult to see what objections can be raised against Owen's suggestion of Anversian (Upper Miocene) age of the specimens from the Red Crag.

Ashley River Phosphate Beds of South Carolina

Although the suggested synonymy of some of the Cetacean remains from these phosphate beds with *Mesoplodon longirostris* is uncertain, there seems to be among them at least one specimen ("*Dioplodon prorops*" Leidy) close enough to Cuvier's species to justify a brief statement on its age. The vertebrate-bearing phosphate rock, named Edisto marl in earlier publications, is now considered as residual Hawthorn formation (Cooke 1936, p. 114). G. M. Allen (1926, p. 447) found that most of the remains of terrestrial mammals from the phosphate beds belong to Pleistocene species, while most of the marine species "are of an equally Miocene facies". The Hawthorn formation from which the phosphate rock was derived is correlated with the lower part of the Alum Bluff group of Florida (Burdigalian), but may also include higher members of this group (equivalents of Helvetian and Tortonian). Kellogg (1928) places the Ziphiidae from South Carolina in the Sarmatian. O. P. Hay (Second Bibliography of Fossil Vertebrates of North America, Carnegie Inst. Publ. No. 390, 1930) refers them to the Upper Mioeene.

Pliocene of Italy

Remains of Ziphiid whales closely resembling *Mesoplodon longirostris*, and probably correctly identified with this species by Abel, have been described from a number of localities in the Pliocene of Italy. Some of them are in the north-eastern foothills of the Apennines and others near Rome (Middle Pliocene).

Description of *Mesoplodon longirostris* from Victoria

The well-preserved specimen from Grange Burn was described in some detail and measured by F. Chapman (1917). A few additional observations are here recorded. The surface of the bone, which is stained dark-brown, is worn smooth, but the differences between the original surface, the areas of other bones which are lost and the later fractures, can be recognized. In pits and furrows some soft whitish rock matrix is preserved, and small oyster shells adhere in some places to the bone. The maxillaries extend about 25 mm. laterally from each of the maxillary foramina. The ventrally projecting basal portions of the maxillaries are broken off. A rougher surface extends ventro-laterally over more than half the length of the rostrum. About 65 mm. from the posterior tip of the vomer on the ventral surface of the rostrum this rougher area widens out in median direction to form a distinct area of attachment for the palatines, ending in a single anterior point on either side. The premaxillary and maxillary foramina are perfectly preserved.

The object described by Chapman (1907, p. 38) as a maxillary tooth was removed from the matrix and carefully examined. Although it resembled a tooth in its peculiar bluntly conical shape, it was found when sectioned to be a concretion without any trace of organic structure. Dr. F. L. Stillwell, who kindly examined the object, found that it consisted almost entirely of limonite.

The new specimen from Lakes Entrance is a cranial rostrum preserved from the area of the maxillary foramina to a bluntly rounded anterior end. The length of the missing distal part, to the tip of the rostrum, can be estimated at between 150 and 250 mm. The foramina were filled with ferruginous matrix, but only the left premaxillary foramen is completely preserved. The lateral extensions of the maxillaries are incomplete, particularly on the left side, and the maxillary crests are lost. A coating of ferruginous matrix on the original surface of the bone is visible in the pre-orbital region and on a small portion of the antero-ventral part of the rostrum. The fossil is deeply weathered and fissured, the fissures being partly filled with calcareous matrix. Subsequent weathering of this matrix has widened the fissures. It appears that the fossil was originally buried in the Kalimnan calcareous deposit in a slightly broken, cracked, and weathered condition. The sediment penetrated the deep cracks of the bone, while on its surface a ferruginous coating was formed in which molluscan fragments have been preserved. Later, the fossil weathered out of the Kalimnan rock and was subjected to erosion on the surface before being embedded in the yellow clay of post-Kalimnan age. Little damage was done in the process of removing it from this sediment, fresh fractures being confined to the right posterior side of the maxillary region and the left side of the anterior part of the rostrum. In the course of the present investigation, a transverse slice about 15 mm. thick was cut from the specimen, about 340 mm. from its present proximal end.

Owing to the deep weathering of the new specimen, little can be added to what is already known of the morphology of the rostrum in *Mesoplodon longirostris.* On the dorsal surface the distal spur of the mesethmoid can be vaguely distinguished. From this point a dark median line (an infilled sulcus) extends a short distance along the surface of the rostrum. It corresponds to the median furrow which was erroneously considered as an essential specific character of *M. longirostris,* but is not consistently developed in any of the known species of the genus. The median proximal part of the ventral surface is exceptionally well prserved in the new rostrum. This is the first specimen to show the peculiar triangular crest or keel descending ventrally between the attachment areas of the pterygoids. Published figures indicate that in most or all Recent species of *Mesoplodon* the rostrum is not nearly as deep in this region, its deepest part being normally the tip of the vomer which in ventral views of some skulls can be seen between the tips of the pterygoids. In *M. longirostris* the postero-ventral side of the rostrum is formed by two laminae, diverging proximally and enclosing at their base the main body of the vomer. Some space between the vomer above and the two laminae below is filled with rock matrix in both Victorian specimens, but in the Grange Burn specimen the projecting ventral part of the laminae is broken off.

Comparisons of measurements and proportions of the two Victorian rostra suggest that the size of the new specimen exceeded that of Chapman's fossil by about one-half. The preserved part of the rostrum is about 450 mm. long, and its original total length can be estimated at about 600-700 mm., corresponding to a skull not less than 3 feet in length. The convex dorsal outline and the almost complete preservation of the projecting ventral crest produce the impression of great relative height of the new rostrum. The maximum height in the present state of preservation is 147 mm., the width immediately in front of the "inner notch" is about 80 mm. The greatest width of the mesorostral band is 36 (22) mm., the approximate distance between the centres of the premaxillary foramina is

60 (38) mm., that between the centres of the maxillary foramina is 125-130 (85) mm. [Figures in parentheses indicate corresponding measurements in Chapman's specimen.]

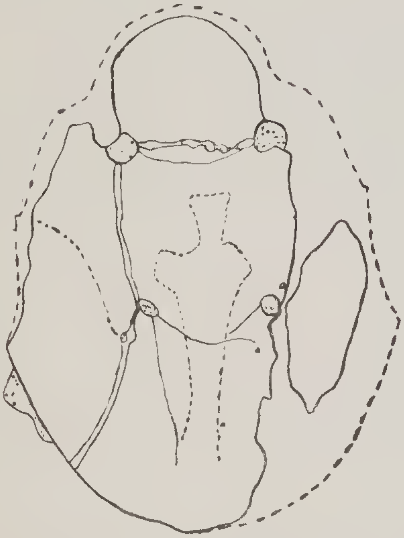

FIG. 1.—*Mesoplodon longirostris* (Cuvier). Transverse section of the rostrum from Lakes Entrance, Victoria. Outline partly restored. 2/3 nat. size.

The transverse section is oval in outline, not unlike those given by Huxley, Owen, and Chapman for *M.* "*compressus*" and by Forbes for *M. grayi* (Forbes 1893, pl. 13, fig. 3; pl. 14, fig. 5). The bones are dense and resemble ivory. Very few larger pores or canals are visible on the polished surface of the cut or in thin sections, but a high porosity becomes evident through capillary action when the specimen is wetted. Three fairly regular gently curved light-coloured bands, about 1 mm. wide, correspond to the matrix-filled cracks on the surface of the specimen. Larger longitudinal canals, circular in section, are found where vertical and horizontal fissures join. Their arrangement is due partly to the regular spacing of the canals which form zones of weakness, and partly to the internal structure of the bone. No definite sutures are visible in section, the components of the rostrum being completely fused. Only a very faint discontinuity in the finer structure of the bone appears to indicate part of the outline of the vomer.

Notes on the Development of the Rostrum in *Mesoplodon*

The peculiar features of the rostrum in beaked whales (*Mesoplodon, Ziphius, Choneziphius*) have been extensively discussed and variously interpreted by a number of authors. Zoologists (Forbes, Fraser, Harmer) investigated the development of the bones in the rostrum, and in particular the comparative anatomy of the mesorostral ossification. Palaeontologists discussed its functional significance. Abel, in his "Palaeobiology of the Vertebrates" (1912) described the ziphiid rostrum as strongly ossified to an ivory-like or porcellaneous mass of bone, with its elements completely fused in adult individuals. In several fossil specimens he found traces of injuries which must have occurred during the life of the individual. He explained the morphological features of the rostrum as adaptations consequent upon its use as a weapon in fights among adult male beaked whales. Injuries, however, are known to occur also in other parts of the body in Cetaceans without inducing adaptive reactions. Even if the Lamarckian view underlying Abel's hypothesis is accepted, it is hardly possible to regard injuries to a bony structure as sufficient evidence of its use as an offensive weapon.

A different explanation was suggested when results of modern experimental pathology were taken into consideration. It was found that a pathological modification of the bone structure to ivory-like density (osteosclerosis), which is frequently accompanied by a general increase in thickness of bones (pachyostosis), corresponds closely to peculiar characters observed in parts of the skeleton of certain fossil Mesosauria, Lacertilia, Ophidia, Sirenia, and Cetacea. F. Nopcsa's pioneer studies in vertebrate palaeo-physiology (1923) and their further development (Sickenberg 1931) led to the conclusion that the change in environment which occurred in the phylogeny of some marine vertebrates was accompanied by peculiarities in the development of their skeleton, among which pachyostosis and osteosclerosis are particularly interesting. They are tentatively attributed to the same causes as the analogous pathological effects, i.e., to reduced thyroid and increased pituitary gland function (hormone secretion). A reduction of oxygen intake and an increase of iodine in the food of originally terrestrial animals becoming adapted to marine life have been suggested as environmental influences likely to cause this type of modification in the skeleton (Sickenberg 1931). Where phylogenetic lineages can be followed, as in the family Halicoridae, a rapid development of pachyostosis and osteosclerosis of parts of the skeleton in the course of evolution is found, followed by gradual decrease.

Slijper, in his monumental work on the comparative anatomy of the whales (1936, p. 475), regards osteosclerosis of the ziphiid rostrum as a normal "functional adaptation." He admits, however, that it could be interpreted alternatively as an "arrostic" phenomenon affecting certain species. He re-defines this term, which was first proposed by Nopcsa, to apply to such anatomical or histological phenomena as are caused by an "unfavourable" adaptation of the metabolism to new environmental conditions (Slijper, l.c.p. 469; see also O. Abel, "Verfehlte Anpassungen bei fossilen Wirbeltieren," *Zool. Jahrb.*, Suppl.-Bd. 15, vol. 1, 1912, p. 597).

In a study of the relation between giantism and the development of the pituitary body of the brain as observed in internal casts of fossil skulls and in living animals, T. Edinger (1942) refers to osteosclerosis in whales as one of the bone changes accompanying phylogenetic hyperpituitary giantism. The author states that this relation cannot be interpreted in Lamarckian terms as an adaptive reaction, as the occurrence of giantism is independent of the type of environment and is accompanied by a variety of apparently unrelated changes in bone structure in different types of vertebrates.

The species *Mesoplodon longirostris* has not attracted much attention in the discussion of the important problem of physiological influences on the evolution of the skeleton in marine vertebrates. This is not surprising as this species is known mainly from fragmentary or badly worn rostra. Most of them have been redeposited from older strata, or carried from the open sea to littoral zones of deposition. It is clear that such circumstances would favour the fossilization of strong and heavily ossified bones and would tend to preserve selectively the most strongly osteosclerotic rostra. Nevertheless, there are reasons to believe that this alone does not satisfactorily account for the difference in ossification which the available descriptions of fossil and Recent skulls of *Mesoplodon* appear to indicate. Some of the Recent skulls have been found loose on beaches, preserved in similar circumstances as the fossil specimens, while others are larger and belong to fully-grown individuals, but are not as strongly ossified as some of the fossil rostra. It is, therefore, suggested that osteosclerosis and possibly also pachyostosis of the rostrum are more strongly developed in the extinct *M. longirostris* than in the living representatives of the genus. This suggestion requires confirmation by means of detailed comparative studies, which should lead to interesting conclusions in view of the stratigraphic and phylogenetic relations of this fossil species to a number of others standing between the primitive squalodontids of the Oligocene and the ziphiids. The fact that the new specimen was found almost in situ and in a much less water-worn condition than most of the previously known rostra justifies the expectation that more complete remains of this species will be found in the Kalimnan.

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Description of Plate

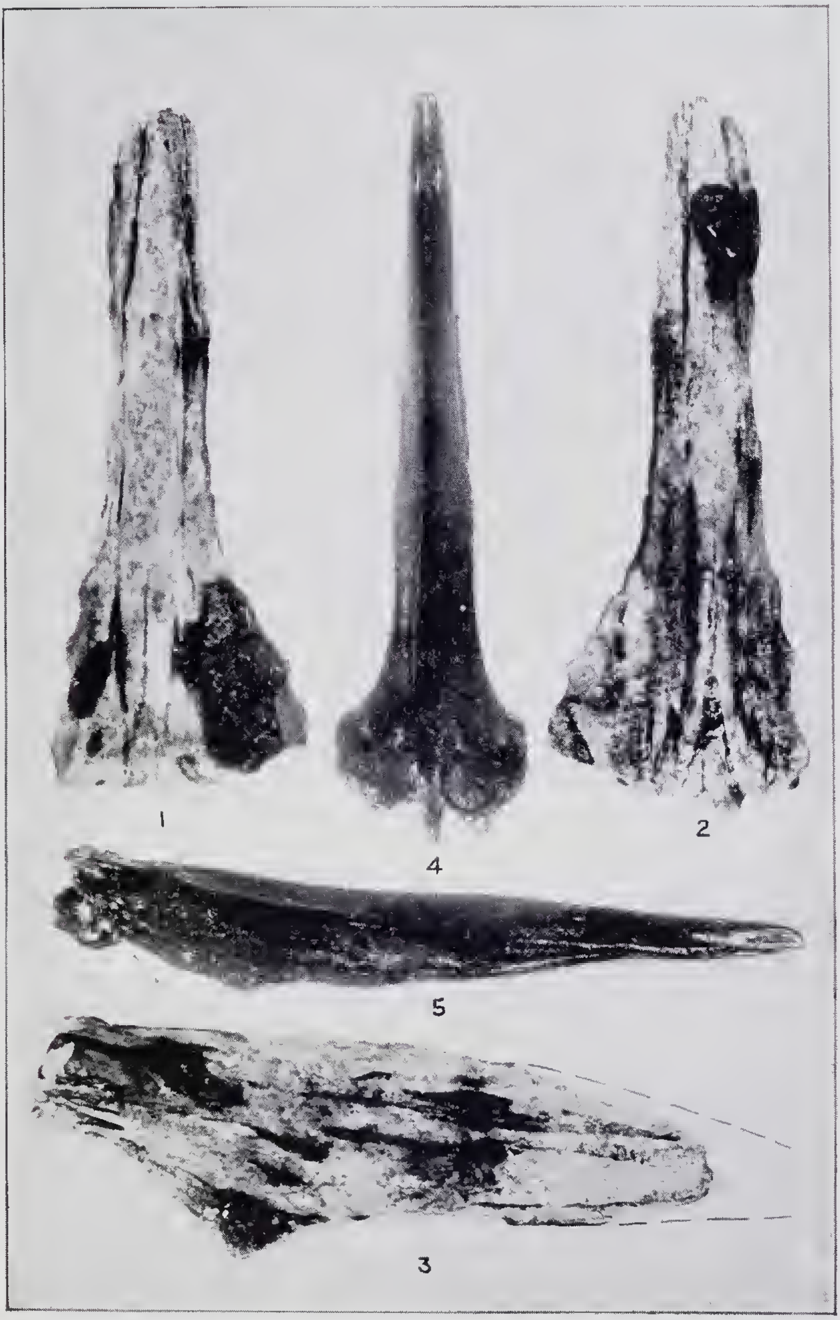
PLATE I.

Mesoplodon longirostris (Cuvier).

FIGS. 1-3.—Rostrum from Lakes Entrance, Victoria. 1—dorsal, 2—ventral, 3—lateral view.

FIGS. 4, 5.—Rostrum from Grange Burn near Hamilton, Victoria. 4—dorsal, 5—lateral view. Type of "*Mesoplodon compressus,*" Chapman 1917.

About ½ nat. size. Photographs by Mr. J. S. Mann, Geology Department, Melbourne University. Original in Commonwealth Palaeontological Collection, Canberra.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